

(54) MODULAR TRANSPORTABLE BUILDINGS

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(57) Claim 1. A house or small building comprised of one or more modules, each individually transportable, with each module adapted to be manufactured off the site (complete with its internal plumbing, electrical wiring, equipment and internal finishes) and where appropriate to be linked to other module or modules (each having where necessary appropriate doorways and facilities for plumbing and/or electrical connections to the other or others) so that apart from placing and linking the modules the major site work comprises only the making of a single connection to the building for each of plumbing, electricity and drainage.

7. A framework with vertically adjustable legs spaced identically with those of the modules, for use as a template for setting out on site the precise position of concrete pads and bolts therein if required to which the legs of modules can be attached.

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SYDNEY

PATENTS ACT 1952-16

TWO DOLLARS

FOURTY DOLLARS

FIFTY DOLLARS

COMPLETE SPECIFICATION

(ORIGINAL)

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Complete Specification for the invention entitled: IMPROVEMENTS IN AND RELATING TO
TRANSPORTABLE BUILDINGS AND STRUCTURES.

The following statement is a full description of this invention, including the best method of performing it known to me:—

*Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 250 mm in depth and 160 mm in width, on tough white paper of good quality and it is to be inserted inside this form.

1.

This invention comprises a system for fully pre-fabricated transportable buildings and structures, in particular housing. It was devised primarily to meet a need for inexpensive housing, and with a view to achieving:-

- (a) ease of manufacture in factories;
- (b) ease and speed of delivery and installation, with a minimum of site preparation and work at the site;
- (c) acceptability as permanent housing;
- (d) low cost and marketability.

Recent statistics show that housing costs are rising faster than general inflation rates and faster than average earnings; and that building costs are rising even faster than general housing costs.

In these circumstances there is a great need for commercially viable low cost houses and other small buildings. An obvious answer is extensive use of pre-fabrication, and work has been done on this. However since the demise of earlier metal designs, recent pre-fabricated houses have been mainly of two types:-

- (a) An alternative way of building essentially traditional massive houses, with modules or parts being pre-fabricated but still requiring extensive site works and extensive construction and finishing work on the site ("kit homes", "modular homes").
- (b) The use of one or more caravans or caravan-like structures ("mobile homes").

The former involves problems in that the site works and construction and finishing works are still lengthy, costly and subject to the weather; and the quantities produced are generally insufficient to give great savings even on the pre-fabricated items. The latter involves problems in that such structures are not acceptable as permanent housing either to the public or to local authorities, and are generally used only in caravan parks or as holiday shacks.

This invention in one aspect is more akin to the latter of those two types, comprising a house made up of modules which could be constructed in a factory to a stage of completion comparable to a completed caravan, transported to the site, and installed at the site with a minimum of site works.

A complete house, of a standard acceptable as permanent housing to the public and to local authorities, could thus be constructed out of one or more modules, and extended by the purchase and installation of further module or modules.

When either a complete house or a module is no longer required, it could easily be detached, transported away, and sold to another person requiring such a house or module.

The invention in one aspect, then, consists of a house or similar small building comprised of one or more modules, each individually transportable, with each module adapted to

be completely manufactured off the site (complete with its internal plumbing, electrical wiring, equipment and internal finishes) and where appropriate to be linked to other module or modules (each having where appropriate doorways and facilities for plumbing and/or electrical connections to the other or others). Accordingly, apart from placing and linking the modules, the major site work would comprise only the making of a single connection to the building for each of plumbing, electricity and drainage.

Each module would normally be completely finished externally (as well as internally) before transportation to the site, except that all or part of one or more walls might lack external cladding where the module is to be joined to another module or modules.

Each module would normally be of a size within the normal range of sizes of caravans, and would normally comprise one, two or three rooms. A convenient size may be about 3 metres by 6 metres by about 3 metres high (apart from the supports described later).

Each module would have provision to be supported by supports or legs, which would anchor the module and spread its weight, either:

- (a) by means of attached feet which could, where appropriate, themselves be of sufficient area to comply with local government and engineering requirements as to foundation pressure, and of sufficient weight to anchor the module; or
- (b) by resting on or being attached (through feet or directly) to concrete or similar pads; or
- (c) otherwise.

Such supports or legs would normally be adjustable, so that the house or building could be installed in a variety of sites without the necessity of providing more than a limited range of support or leg sizes; and so that minor adjustments could be made to the position of the module if and when necessary. Provision could also be made to remove the feet of such supports or legs, and replace them with wheels or castors to enable the module (perhaps with the aid of other mechanical device or devices) to be manoeuvred.

Such adjustable supports or legs, particularly the legs of the type described later, are an important aspect of this invention, and could be used for all types of transportable buildings or structures, including caravans, sheds, offices, toilets, garages, carports and "granny flats".

The modules could be adapted for easy transportation and installation. In particular, a trailer could be provided specially adapted to transport a module and manoeuvre it into position on the site. Such a trailer could be designed to be towed by a car or other medium-sized vehicle, and could be provided with hydraulic rams or jacks to raise the module to the required height, so that the supports or legs could be mounted and/or adjusted, and the trailer removed. The feet of the jacks or rams could be made removable, so that they could be replaced by wheels or castors to enable the trailer and module (perhaps with the aid of some other mechanical device or devices) to be manoeuvred into position. Such a trailer is another aspect of the invention, and could be used for all types of transportable buildings and structures.

One form of the invention will now be described, with reference to accompanying drawings. This is intended as an

example only, and not as limiting the scope of the invention.

Fig. 1 shows a house on a sloping site comprising five modules (1, 2, 3, 4 and 5) attached in a row, each supported by an extendable metal pipe-shaped leg (6) at each corner projecting into a larger metal pipe-shaped member (7) built into each corner of the module. Where the legs are more than (say) one metre long, they are braced by diagonal struts (8). (As an alternative, they could be braced by panels which would also give weather protection to the area under the house).

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The space under module 5 could be used for storing a motor car. In addition to the five modules, a further prefabricated unit (9), also with pipe-shaped legs provides an entrance verandah. (Such a verandah could be extended by similar units in front of the other modules, and a roof could be provided joining to the module roof and supported by longer members at the other corners of each verandah unit). Each leg is supported by a foot (10). Where two legs closely adjoin, they share a foot (11).

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Fig. 2 shows a smaller house comprising only modules 3 and 4, with a view of the other side of those modules. A further pre-fabricated unit(12) provides a landing and steps. The door (13) would provide the front door for this house, and could be served by a landing 12 or verandah 9 (Fig. 1). If module 2 was later added, this door would give access to module 2 (the door then being mounted on a wider door frame bridging the modules, as described later).

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Fig. 3 shows a plan of the house shown in Fig. 1. Modules 3 and 4 are the basic modules, module 3 comprising a kitchen (14) 2200 mm. by 3000 mm. and a sitting and eating area (15) 3800 mm. by 3000 mm., and module 4 comprising a bathroom-laundry (16) 2200 mm. by 3000 mm. and a bedroom or

playroom or study area (17) 3800 mm. by 3000 mm.

A house could comprise just these two modules, and the door (13) would then be the front door. The doorways (18) in module 4 would at this stage be covered externally, along with the whole of the wall in which they are situated by a removable external cladding, and internally by a decorative panel.

Normally, module 5 would be next added, comprising two bedrooms each 3000 mm. by 3000 mm. Next, module 2, comprising a single room which could be a bed-sitting room or a lounge room, to which access could be had from a verandah 9 through a sliding door. Next, module 1 comprising a bedroom (19) and ensuite bathroom (20).

Fig. 4 shows a single module (in this case, module 3) in position on a site sloping in two directions and ready to have module 4 attached to it. The pipe-shaped members (7) at each corner are attached to the framework of the walls and floor. This framework can be of any appropriate materials and construction, and with mass production new types of construction could be developed. However, the use of conventional materials and construction would be satisfactory. Provision is made for bolting the framework to that of the next module through appropriately placed holes (21). (The ends of some of these bolts would project into the rooms, and appropriate covers would be provided). In addition, plates placed across and screwed into the corresponding door opening members (22) and the bottom of the wall frame (23) would help to secure the modules together. A door frame and threshold could then be mounted, bridging the door openings of the two modules. Provision is made (24) for connecting water, electricity and drainage to the next module. Between some other modules

(for example, 4 and 5), only electricity connection would be necessary. The module is finished internally and externally except for cladding on the facing wall: if it were to be the end module, external cladding would have been screwed to the wall framework, in such a manner as to be easily removable should it later be desired to add another module. The top of such cladding would be covered by an angled piece going over on to the end of the roof. Where two modules are joined, the roof of one would just overlap that of the next (for example, 10 by one corrugation), and a sealing strip would be placed between the adjoining corner members (7).

RBT
Fig. 5 shows a section through a corner pipe member (7) showing the end of the leg (6) inserted therein. A screw thread (25) located (say) above the lower end of the member (7) engages with a screw (say) 500 mm. long on the top of the leg, giving a vertical adjustment range of (say) 300 mm. This can be effected by twisting the leg using a large wrench engaging a sextagonal nut (26) attached to the bottom of the leg just above a ball joint (27) to which the foot can be attached.

Figs. 6 and 7 show respectively a single foot and a double foot. Each foot is in two pieces which are bolted together to form a socket (or in the case of the double foot, two sockets) which receives and clamps firmly on the ball at the end of the leg. This ball joint (when not fully tightened) allows the leg to be twisted in order to be raised or lowered. It also allows the foot to adopt a position which spreads the weight supported by the leg without tending to bend the leg, notwithstanding that the ground or concrete pad may not be perfectly horizontal. Because each foot is in two parts,

it can be attached and detached without having to raise the leg or the module higher than its desired position. (This could be useful especially if it is desired to replace the feet by wheels or castors for manoeuvring the module). The feet can be riveted or bolted to a concrete pad through holes in the plate of each foot.

Fig. 8 shows a module on a trailer designed to carry modules of this particular size. At each end of the trailer are hydraulic rams (28) which would be used, when the trailer has taken the module to the desired position, to raise it to (or slightly above) the desired height so that the legs and feet can be installed and adjusted. The rams would then be withdrawn, and then removed from the trailer, so that the trailer could then be manoeuvred from underneath the module. A tow-bar (29) is also shown.

Fig. 9 shows the framework of the trailer. Two of the rams (28) are shown detached from the framework. (To simplify the drawing, the hydraulic equipment and lines are not shown, nor are the wheels or suspension). Also shown is a castor (30) which can replace the feet of the rams to enable fine adjustments to be made to the position of the trailer and module.

Where permission can be obtained for transporting wider modules by road, widths of (say) 3600 mm. could be used, rather than 3000 mm. The invention would also be appropriate for the use of longer modules (say 9000 mm). Figs. 10 and 11 show respectively a general view and a plan of a house using three modules (31, 32, 33) of about 9000 mm. by 3000 mm. In this case, in addition

to legs at each corner, two further similarly adjustable legs (34) are provided along each side of each module. Three verandah units (35, 36, 37) are attached to the modules.

In Fig. 11, module 31 is shown on the left comprising a bedroom or study (38), bathroom (39) and kitchen-larder (40). Module 32 is in the middle, comprising a living area (41) and eating area (42) with front (43) and rear (44) entrances. Module 33, which could be added later, comprises two bedrooms (45) and a study recess (46). As an alternative, or a later addition, a module could be provided similar to module 33, but omitting one dividing wall to make one bedroom and a larger playroom. Such a design, on a reasonably level site, could be provided (either originally or later) with legs 2500 mm. or more long, so that an area under the house could be used for parking cars and as covered play space. Kits could be designed to screen or enclose, and also perhaps provide a floor for, some or all of this area, to a standard appropriate to a rumpus room).

The invention could also be adapted to two-storey designs with habitable rooms on both floors, although road transportation would be more difficult. However, provision could be made to transport a two-storey module to the site reduced in height, but otherwise complete, for example by having the roof structure resting on the lower 900 mm. of the walls of the upper storey, with provision for the roof to be raised 1500 mm. at the site

by removable jacks. Then, ready-made posts, panels and windows could be inserted to complete the module.

18. Figs. 12 and 13 show respectively a general view and a plan of a two-storey house comprised of two modules each about 9000 mm. by 3000 mm., which would be suitable for row or terrace housing. The lower storey comprises (in one module) a bedroom or study (47), an ensuite bathroom (48) located under the upper part of the stairwell, a kitchen-laundry (49), and (in the other module) a living (50) and eating (51) area. The upper level comprises three bedrooms (52), study or play area (53) and bathroom (54).

Fig. 14 shows a single two storey module on the site. The roof structure has been jacked to the desired height, posts (55) inserted, and the jacks removed. It remains for windows to be inserted at the front and rear, internal wall panels and doors to be installed, and cladding screwed to the top of the external wall.

20. It should be noted that this type of housing could be readily adapted to incorporating, by mass production, facilities for use of solar power, collection of rainwater, use of waste matter, and other features appropriate for economic use of energy and resources. On the other hand, production could be effected without expensive tooling, using conventional materials and methods, and production techniques similar to those used by caravan builders. Designs by architects could be used, and any materials would be used other than

brick, stone, concrete and roofing tiles; so the house should be saleable even if cost savings are initially small. There is the further advantage to a first home buyer of being able to start with an absolute minimum house of 5 m. by 6 m.

It was noted earlier that buildings comprised of modules as described could be extended by the provision of legs 1500 cm. or more long, and by enclosing the area under the modules by means of kits. The additional length for such legs could conveniently be provided by inserting between a module and existing legs a standardised leg extension of appropriate length for ordinary room height, which would fit into the corner pipes of the modules in the same way as ordinary legs, and would themselves be adapted in the same way as the corner pipes to receive the legs. Such standardised leg extensions could be adapted to have attached to them wall panels, and suspended flocking, to provide complete rooms under the elevated modules.

Finally, to aid site preparation, it would be possible also to provide a framework with vertically adjustable legs spaced identically with those of the modules, for use as a template for setting out on the site the precise position of concrete pads, and bolts therein if required, to which the legs of modules can be attached.

The claims defining the invention are as follows:

1. A house or small building comprised of one or more modules, each individually transportable, with each module adapted to be manufactured off the site (complete with its internal plumbing, electrical wiring, equipment and internal finishes) and where appropriate to be linked to other module or modules (each having where necessary appropriate doorways and facilities for plumbing and/or electrical connections to the other or others) so that apart from placing and linking the modules the major site work comprises only the making of a single connection to the building for each of plumbing, electricity and drainage.

2. A house or building or structure (including a caravan, shed, office, toilet, garage, carpent or granny flat) comprised of one or more modules, where each module has provision to be supported by supports or legs, which anchor the module and spread its weight

- (a) by means of attached feet of sufficient weight and area; or
- (b) by resting on or being attached (through feet or directly) to concrete pads; or
- (c) otherwise.

3. A house or building or structure as in 2, where the supports or legs are adjustable as illustrated in the above example or otherwise, so that the house or building or structure can easily be installed in a variety of sites without the necessity of any major site preparation or more than a limited range of support or leg sizes; and so

that minor adjustments to the position of the module can be made as and when necessary.

4. A house or building or structure as in 2, where the supports or legs may be or may (by virtue of the insertion of appropriate support or leg extensions between the modules and the existing legs or supports) become of sufficient length to give usable space below one or more modules, and provision is made for attaching standardised panels to the supports or legs to brace them and give protection to the space below the modules, and/or provision is made for attaching standardised flooring units to the supports or legs to form a room or rooms underneath the module or modules.

5. A house or building or structure comprised of one or more modules where the modules are adapted to be transported to the site and installed without the necessity of heavy equipment, and a means of transporting such modules to the site and manoeuvring them for installation, namely a trailer or semi-trailer adapted to carry one module and to be towed by a small or medium sized or large vehicle, and provided with hydraulic rams or jacks or similar means to raise the module to the required height, so that legs or supports can be mounted and/or adjusted, and the trailer removed.

6. A trailer as in 5, where wheels or castors may be attached to the rams or jacks to enable the trailer and the module to be manoeuvred.

7. A framework with vertically adjustable legs spaced identically with those of the modules, for use as a template for setting out on site the precise position of concrete pads and bolts therein if required to which the legs of modules can be attached.

8. A house or building comprised of one or more modules, where one or more of such modules contains two storeys, and can be transported to the site virtually complete but reduced in height, for example by having the roof structure

10 resting on the lower 900 mm. of the walls of the upper storey, with provision for the roof to be raised at the site by removable jacks and for ready-made posts, panels and windows to be inserted to complete the module.

9. Such combination of two or more of the above.

DATED THIS.... 31st DAY OF OCTOBER 1983.

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R. B. Hodgson

RAEWYN BEVERLEY HODGSON
(Name of Applicant)

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FIG. 1

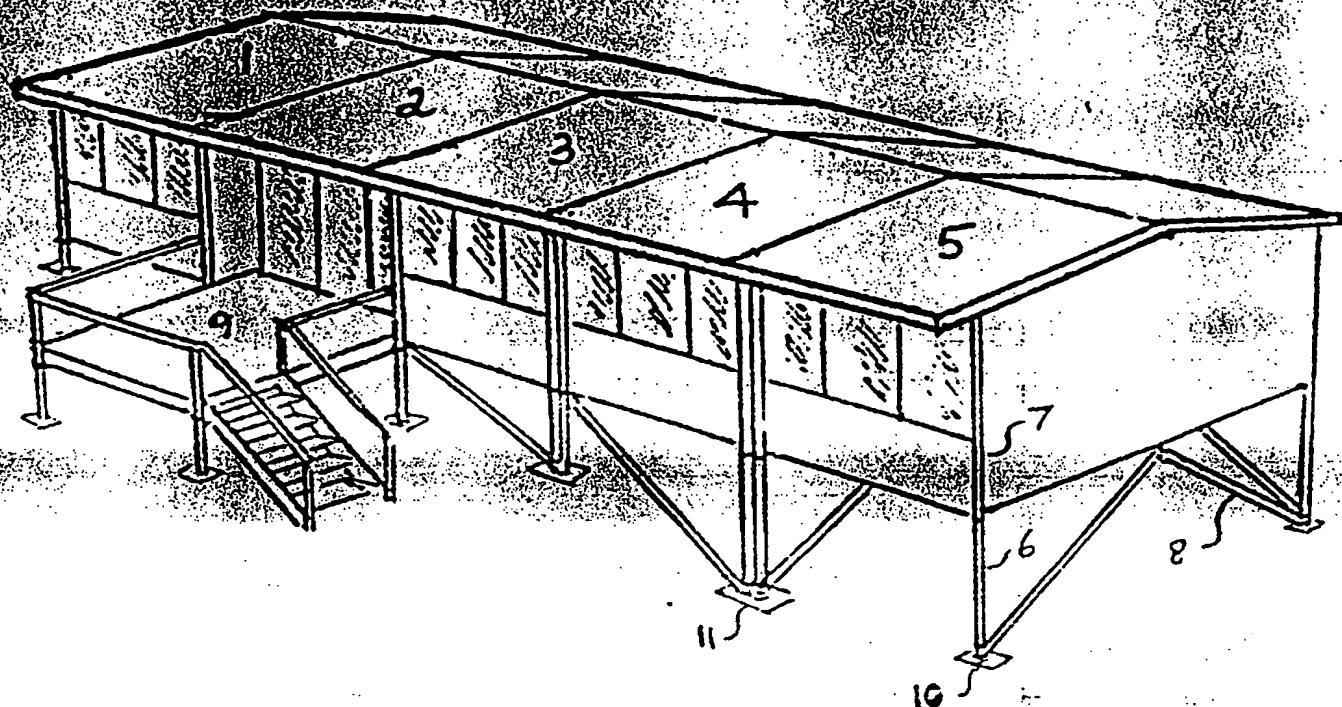
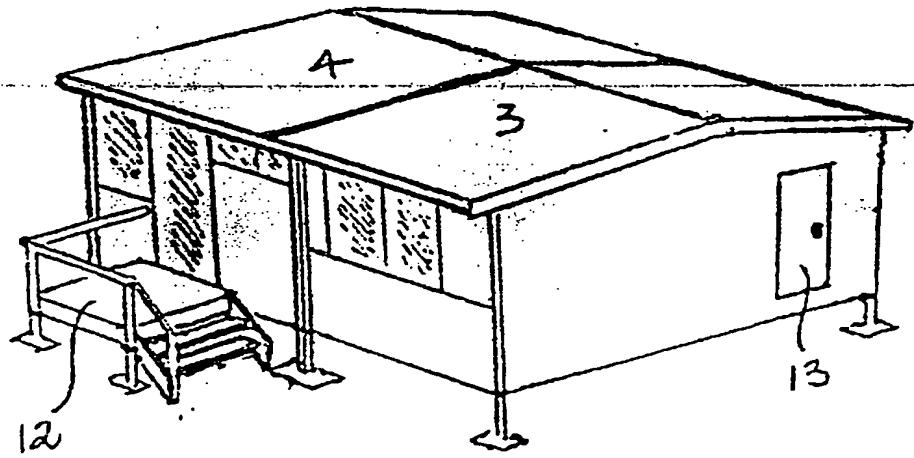


FIG. 2



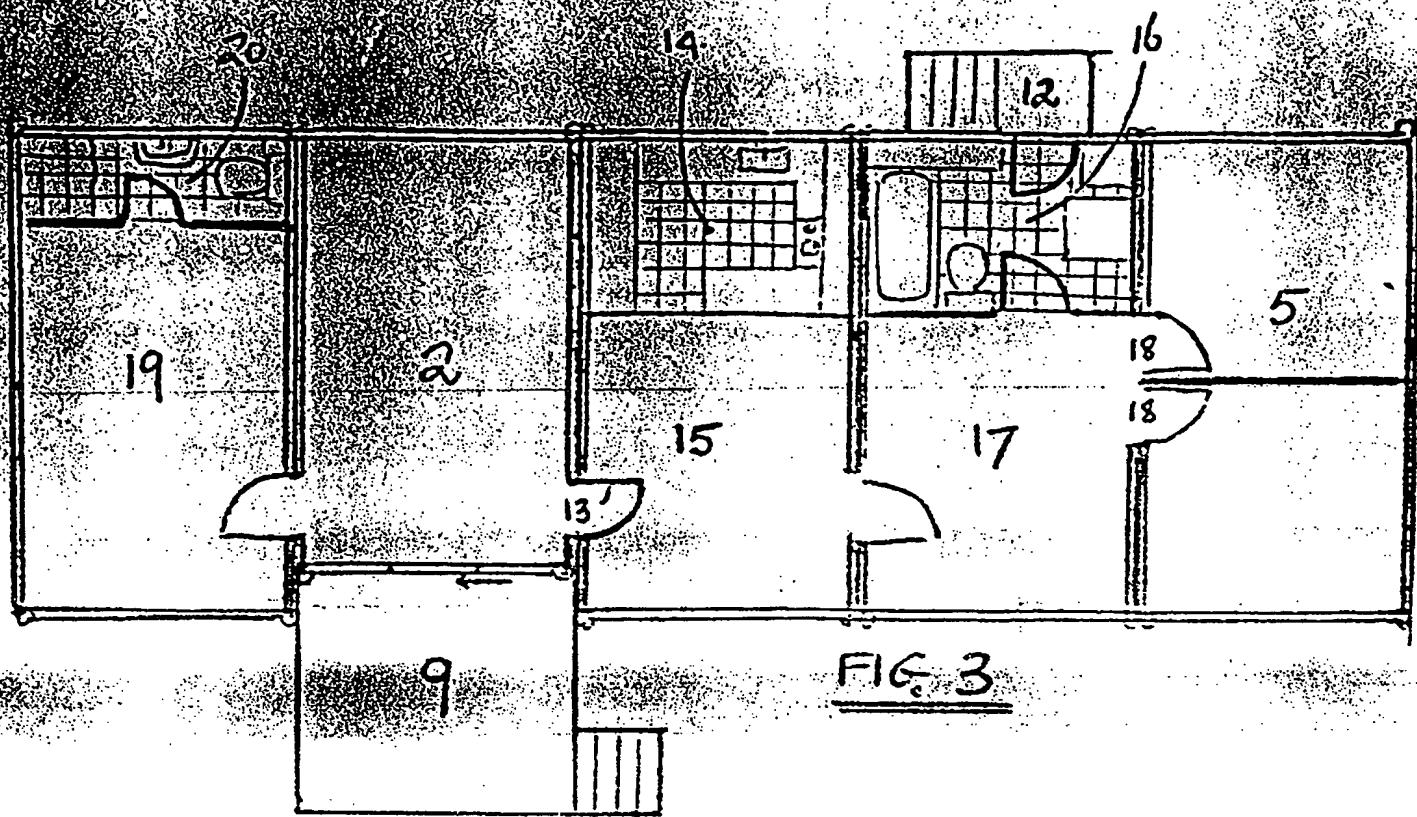


FIG. 3

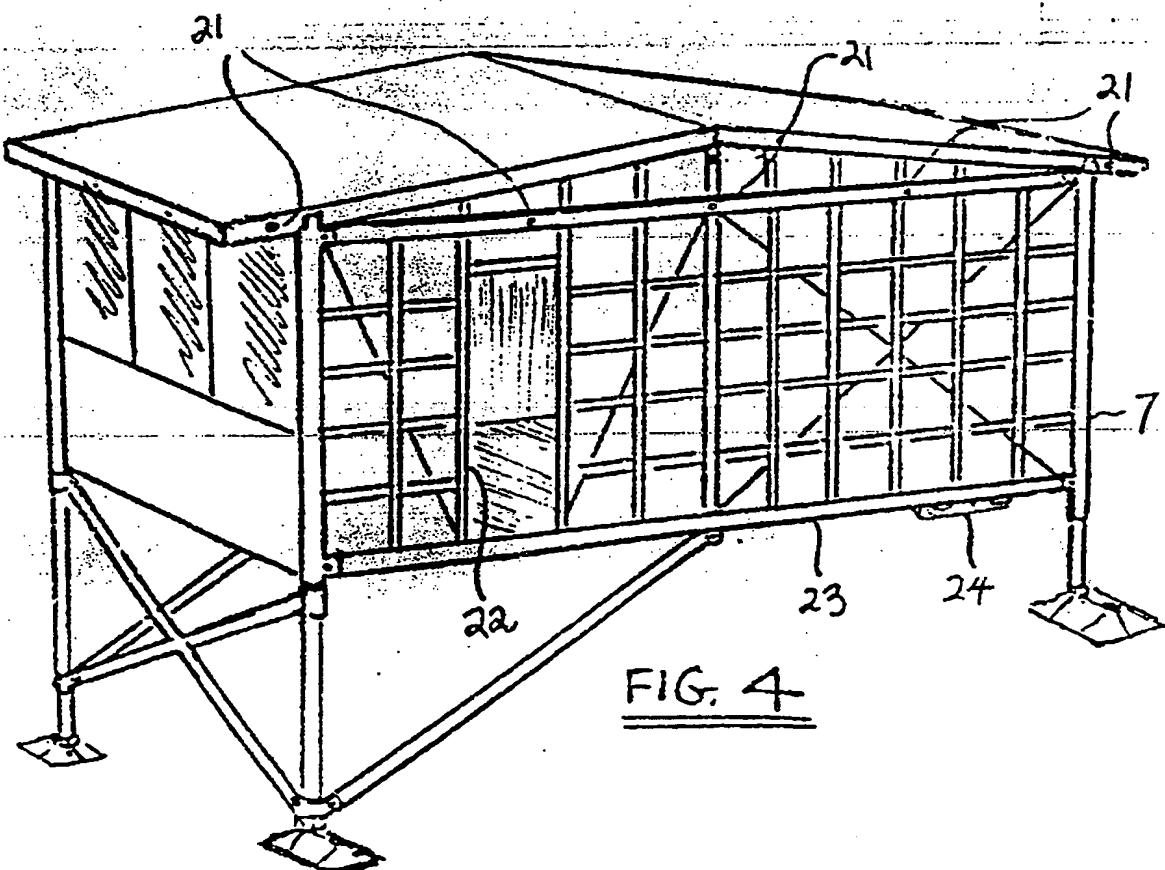


FIG. 4

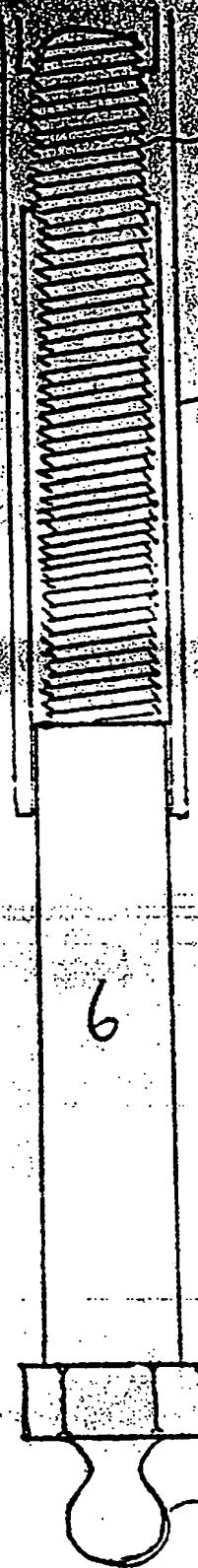


FIG. 5

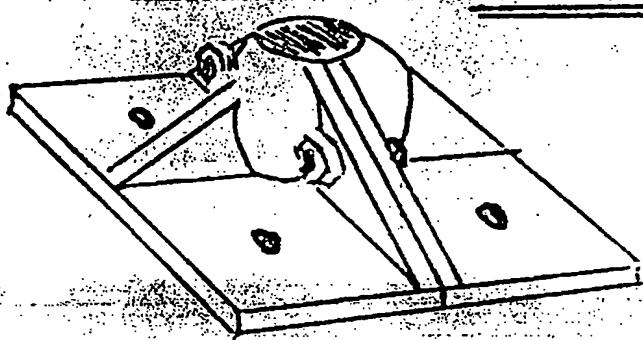


FIG. 6

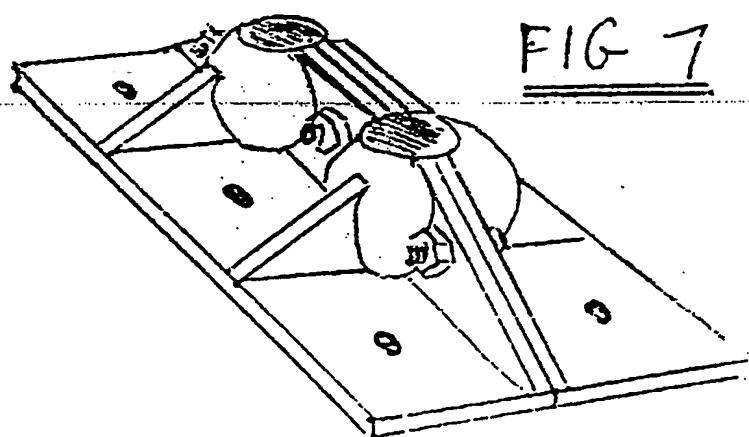


FIG. 7

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FIG. 8

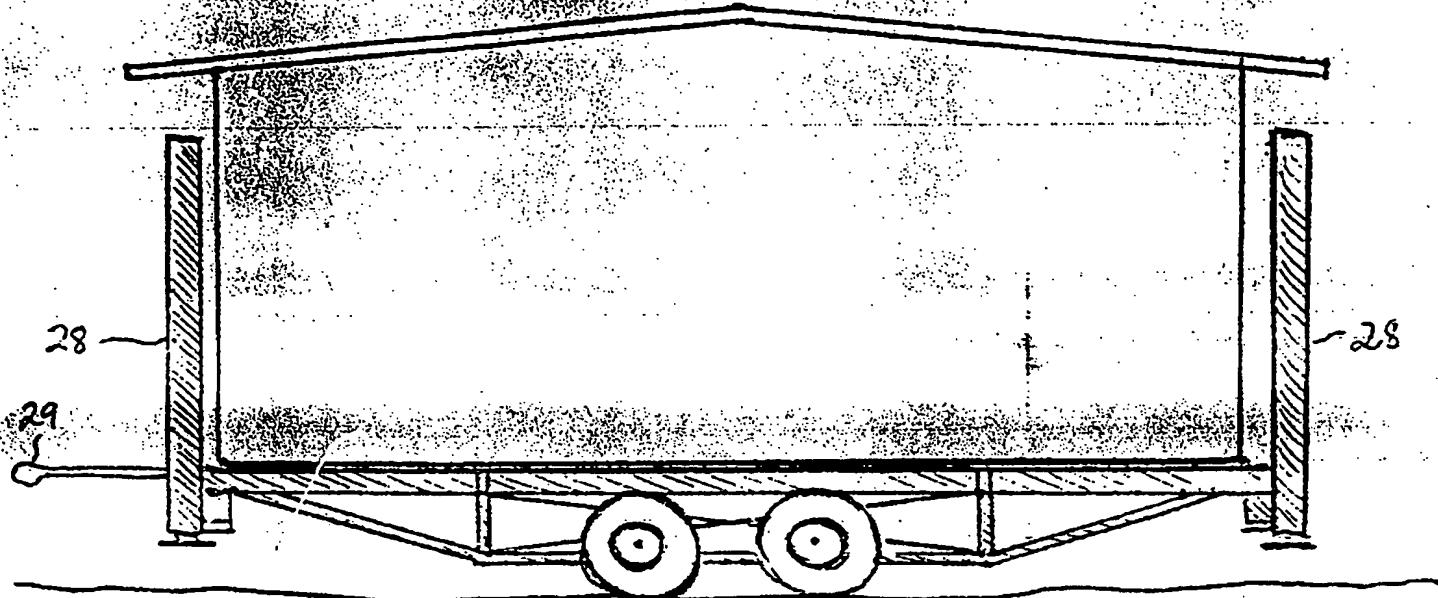
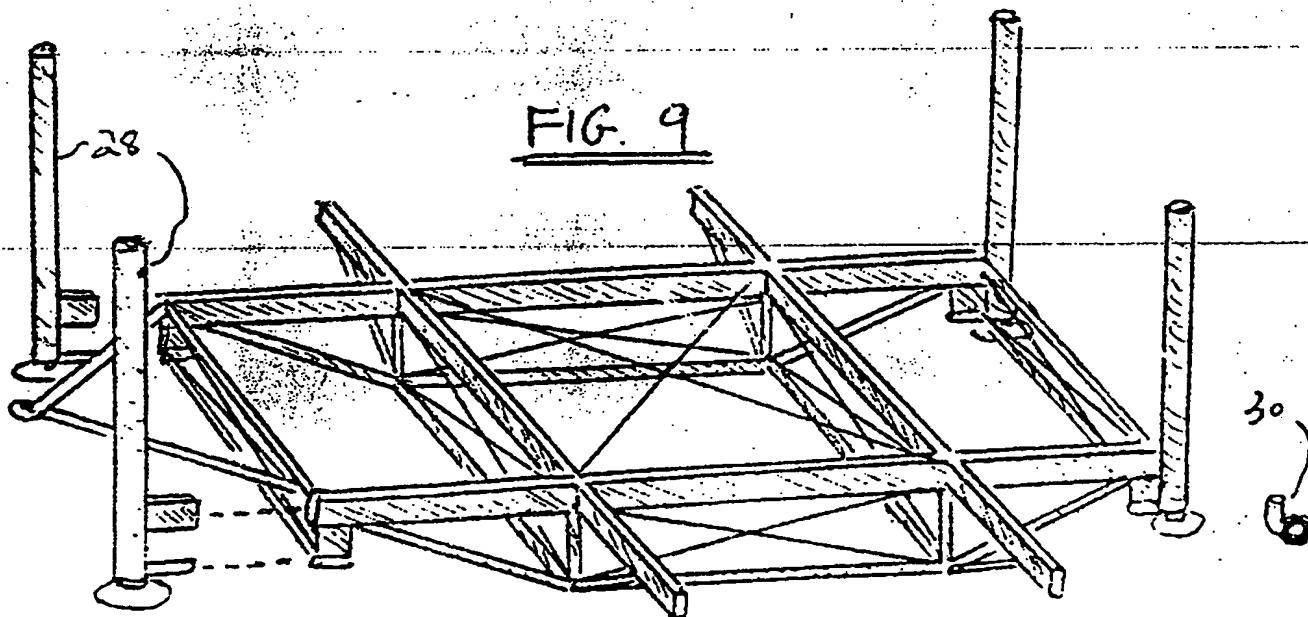


FIG. 9



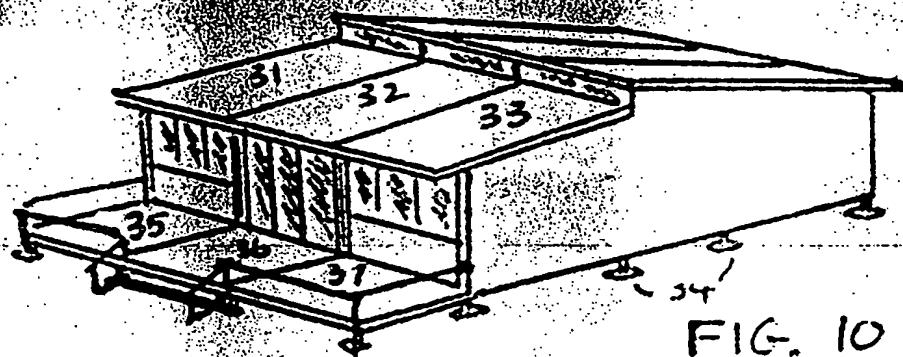
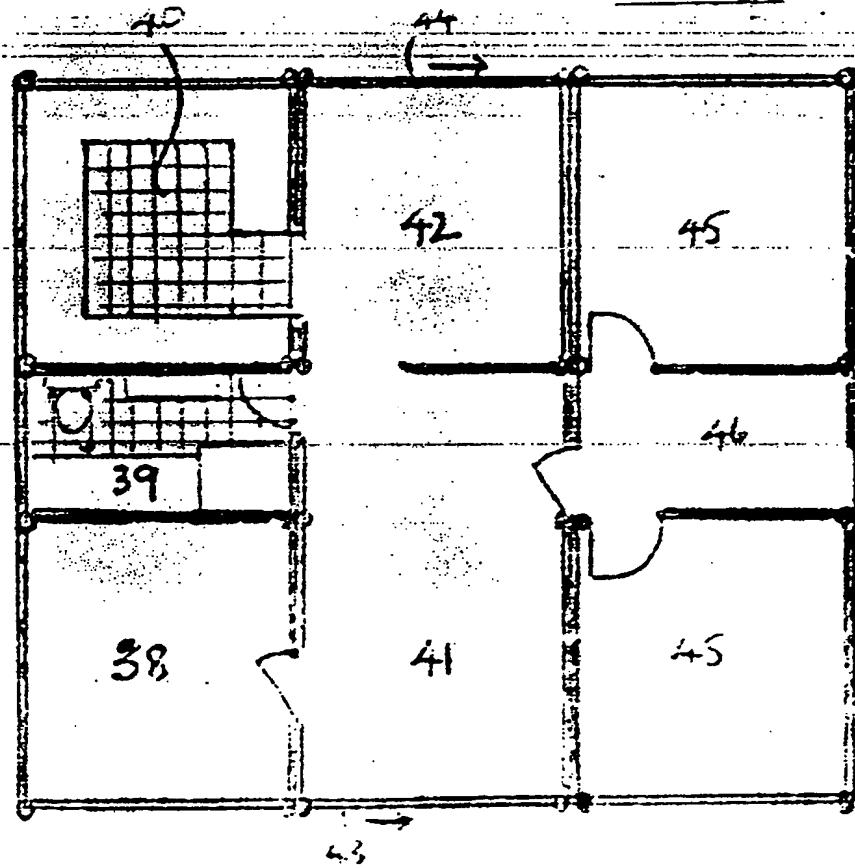


FIG. 10

FIG. 11



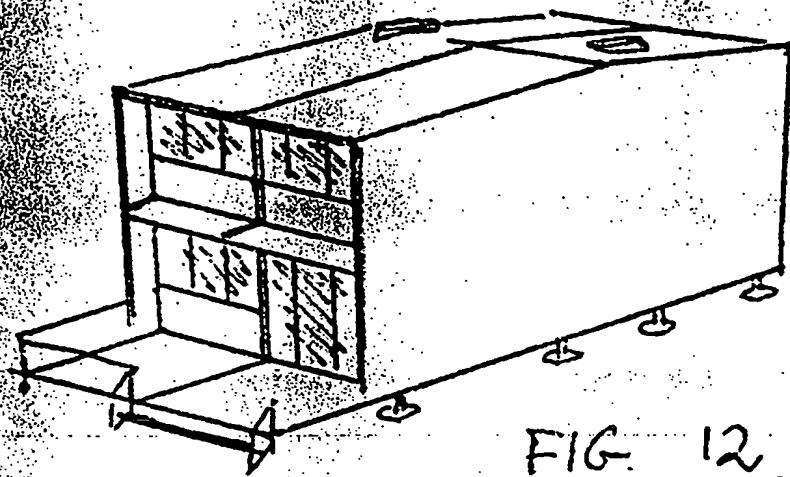


FIG. 12

FIG. 13

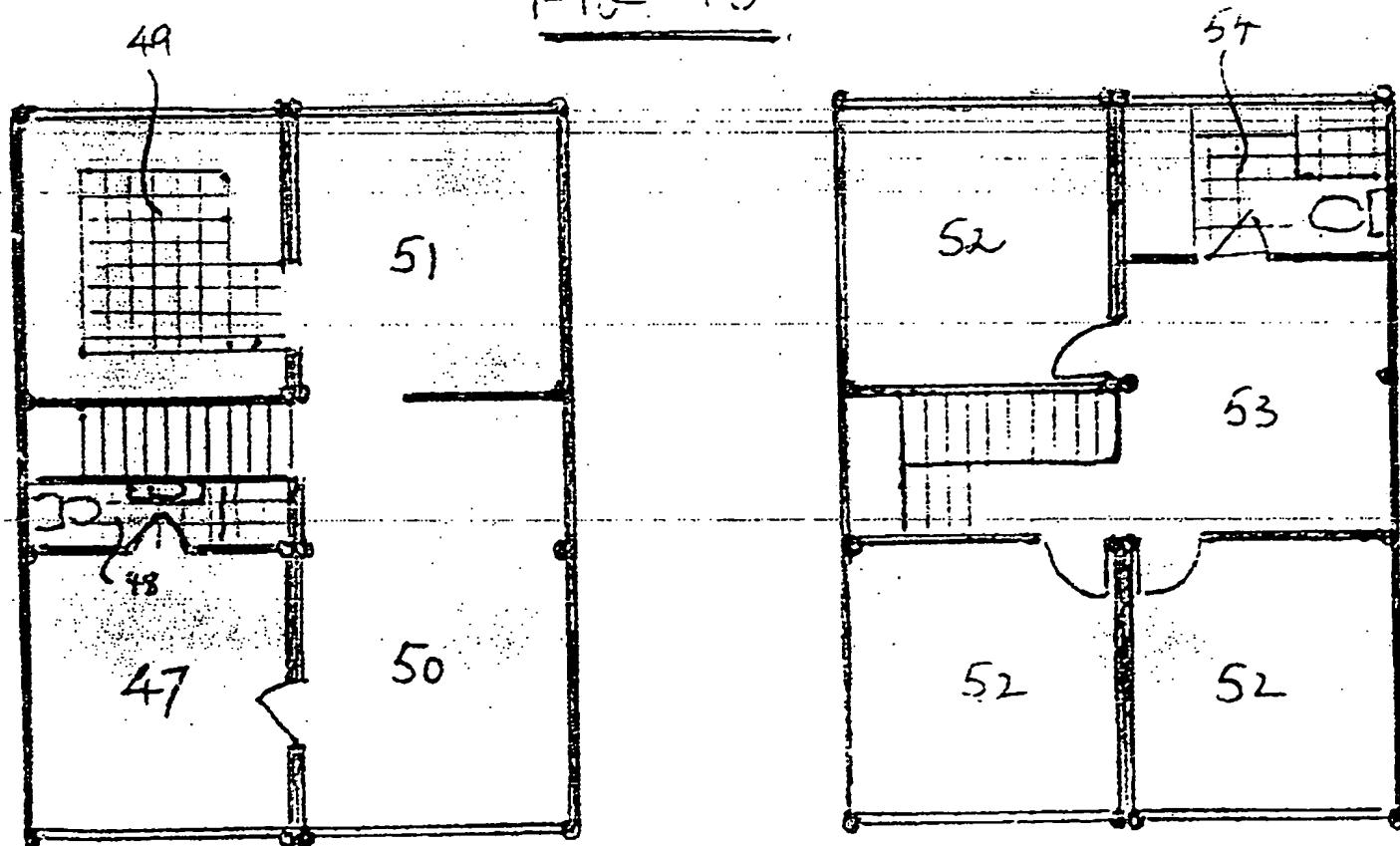
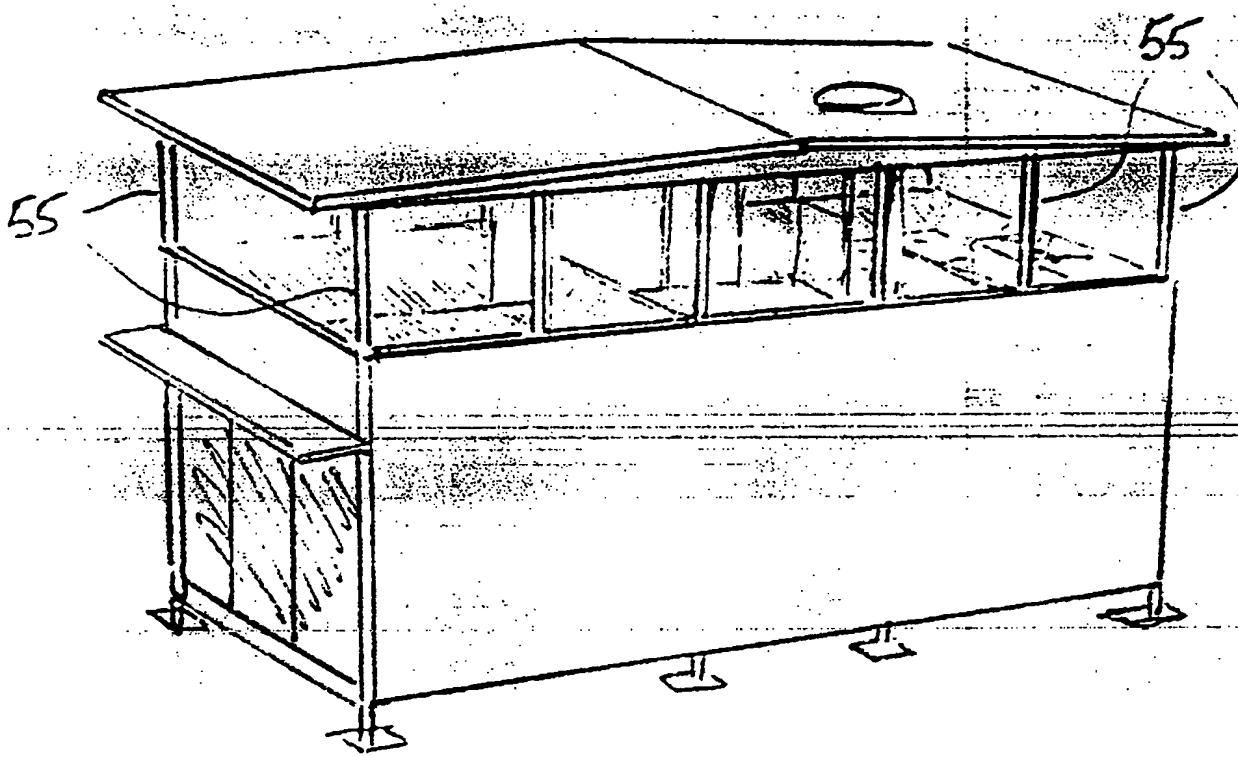


FIG. 14



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